BS EN 16712-1:2015

BSI Standards Publication

Portable equipment for projecting extinguishing agents supplied by fire fighting pumps — Portable foam equipment

Part 1: Inductors PN 16

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National foreword

This British Standard is the UK implementation of EN 16712-1:2015.

The UK participation in its preparation was entrusted to Technical Committee FSH/17, Fire brigade equipment.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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English Version

Portable equipment for projecting extinguishing agents supplied by fire fighting pumps - Portable foam equipment - Part 1: Inductors PN 16

Equipement portable de projection d'agents d'extinction alimenté par des pompes à usage incendie - Equipements mousse portables - Partie 1 : Proportionneurs PN 16

Tragbare Geräte zum Ausbringen von Löschmitteln, die mit Feuerlöschpumpen gefördert werden - Tragbare Schaumgeräte - Teil 1: Zumischer PN 16

This European Standard was approved by CEN on 1 August 2015.

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European foreword

This document (EN 16712-1:2015) has been prepared by Technical Committee CEN/TC 192 "Fire and Rescue Service Equipment", the secretariat of which is held by BSI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by March 2016, and conflicting national standards shall be withdrawn at the latest by March 2016.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

EN 16712 consists of the following parts, under the general title "*Portable equipment for projecting extinguishing agents supplied by fire fighting pumps – Portable foam equipment*":

— Part 1: Inductors PN 16;

— Part 2: Pick-up tubes;

— Part 3: Low and medium expansion hand-held foam branchpipes PN 16;

— Part 4: High expansion foam generators PN 16.

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Introduction

The inductor is only one piece in the foam system. Other components such as branchpipes, pick-up tubes and delivery hoses should be taken into account (see Figure 2 as example of installation).

1 Scope

1.1 This European Standard defines requirements and tests which apply to inductors PN 16 which are used to proportion foam concentrate or other additives to the water stream and work using the Venturi principle.

1.2 This European Standard is not applicable to inductors which are integrated in self-inducting foam branchpipe.

1.3 This European Standard is not applicable to inductors which have been manufactured before its date of publication as European Standard.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 837-1, *Pressure gauges — Part 1: Bourdon tube pressure gauges — Dimensions, metrology, requirements and testing*

EN 837-3, *Pressure gauges — Part 3: Diaphragm and capsule pressure gauges — Dimensions, metrology, requirements and testing*

EN 16712-2, *Portable equipment for projecting extinguishing agents supplied by fire fighting pumps — Portable foam equipment — Part 2: Pick-up tubes*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
inductor
equipment which, using the Venturi principle, induces foam concentrates or other additives into a water flow to produce a solution at a predetermined ratio

Note 1 to entry: Venturi principle: a negative pressure is created in a suction chamber by means of the injector effect.

3.2
regulating device
automatic device that regulates Δp_2

3.3
setting device
device to select the proportion ratio

3.4
proportion ratio
percentage of foam concentrates or additives in the foam water solution

EXAMPLE If a hand-held foam branchpipe is used to flow 400 l/min of foam water solution at a proportion ratio of 3 %, the foam concentrate flow will be 12 l/min.

3.5
foam water solution
homogeneous mixture of water and foam concentrate

Note 1 to entry: Foam concentrates are defined in EN 1568 series.

3.6
pressures
Note 1 to entry: Pressures are expressed in bar, measured with respect to atmospheric pressure.

Note 2 to entry: 1 bar = 0,1 MPa (10^5 Pa).

3.6.1
foam branchpipe working pressure
p_1
pressure measured at the inlet of the foam branchpipe

3.6.2
outlet working pressure
p_2
pressure measured at the outlet of the inductor

3.6.3
inlet working pressure
p_3
pressure measured at the inlet of the inductor

3.6.4
nominal pressure
p_N
maximum working pressure measured at the inlet of the inductor

3.6.5
test pressure
p_t
static pressure used for leakage tests

3.6.6
burst pressure
p_B
static pressure used for burst test

3.6.7
inductor pressure loss
Δp_2
pressure difference between the inlet of the inductor and the outlet of the inductor ($p_3 - p_2$) expressed in percentage of p_3

Note 1 to entry: The pressure loss of the inductor can be calculated with the following formula: $\Delta p_2 = \frac{p_3 - p_2}{p_3}.100$.

3.7
geodetic suction height
$H_{S\,geo}$
distance measured from the central axis of the inductor to the lowest point at which foam concentrate or additive is supplied

4 Inductor types

The inductors are categorized by the foam water solution flow rate of the inductor in types according to Table 1.

Table 1 — Inductor types

Type	Nominal flow rate of inductor [a] l/min	Regulating device	Minimum inside diameter of the connection	
			Water inlet/Foam water solution outlet	Foam concentrate inlet
Z 0,5	50	without	25,4 mm (1”)	25,4 mm (1”)
Z 0,5R		with		
Z 1	100	without	25,4 mm (1”) or 38 mm (1,5”) or 51 mm (2”)	
Z 1R		with		
Z 2	200	without	38 mm (1,5”) or 51 mm (2”)	
Z 2R		with		
Z 4	400	without	51 mm (2”) or 63,5 mm (2,5”)	
Z 4R		with		
Z 8	800	without	51 mm (2”) or 63,5 mm (2,5”)	
Z 8R		with		

[a] Measured at p_1 = 5 bar, p_2 = 6,5 bar and $\Delta p_2 \leq 35$ %

5 Designation

The designation of an inductor in compliance with EN 16712-1 comprises

— name,

— reference to EN 16712-1,

— type.

EXAMPLE 1 Designation of an inductor with a nominal foam water solution flow rate of 200 l/min:

Inductor EN 16712–1 — Z 2

EXAMPLE 2 Designation of an inductor with a nominal foam water solution flow rate of 200 l/min and a regulating device:

Inductor EN 16712–1 — Z 2R

6 Material

Inductors shall be made of materials (with or without coatings) whose surfaces and function are not affected by the extinguishing agents or the environment in which they operate.

Depending on special application of the inductor (e.g. fire-fighting on sea-going vessels, disinfection etc.), the list of appropriate materials to be used (e.g. metal, plastic) shall be agreed upon between the manufacturer and the customer.

The materials used shall be selected so that all the requirements in Clause 7 are met, subject to the tests defined in this European Standard.

7 Requirements and verification

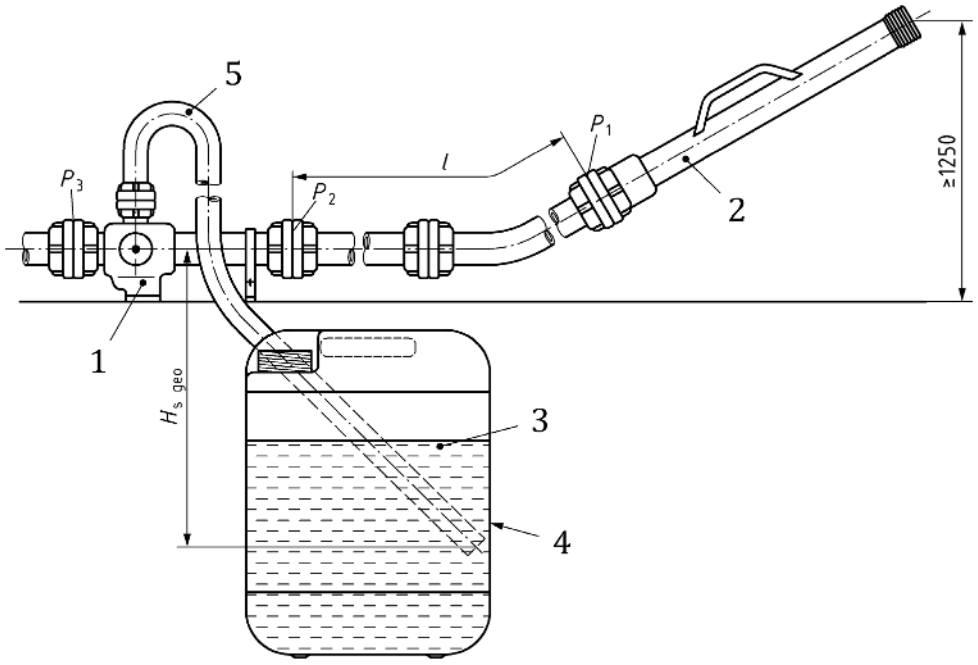
7.1 General

All the tests defined in this European Standard are type tests.

The tests shall be carried out according to Figure 1 and Figure 3, using water in place of foam concentrate and pressure gauges according to EN 837-1 or EN 837-3; accuracy class 2, and under the following conditions: water and air temperature between 5 °C and 30 °C.

NOTE Guidance for acceptance tests on delivery is given in Annex A.

Dimensions in millimetres



Key

$H_{s\,geo}$	geodetic suction height-inductor in meter	1	inductor
l	hose length	2	hand-held foam branchpipe
p_1	foam branchpipe working pressure	3	foam concentrate or additive
p_2	outlet working pressure	4	foam container
p_3	inlet working pressure	5	pick-up tube

Figure 1 — Measure instruction

7.2 Components, dimensions and mass

7.2.1 The inductor shall be equipped at the water inlet, water foam solution outlet and at the foam concentrate inlet with connections according to Table 1.

7.2.2 A back flow preventer shall be installed in the foam concentrate inlet of the inductor.

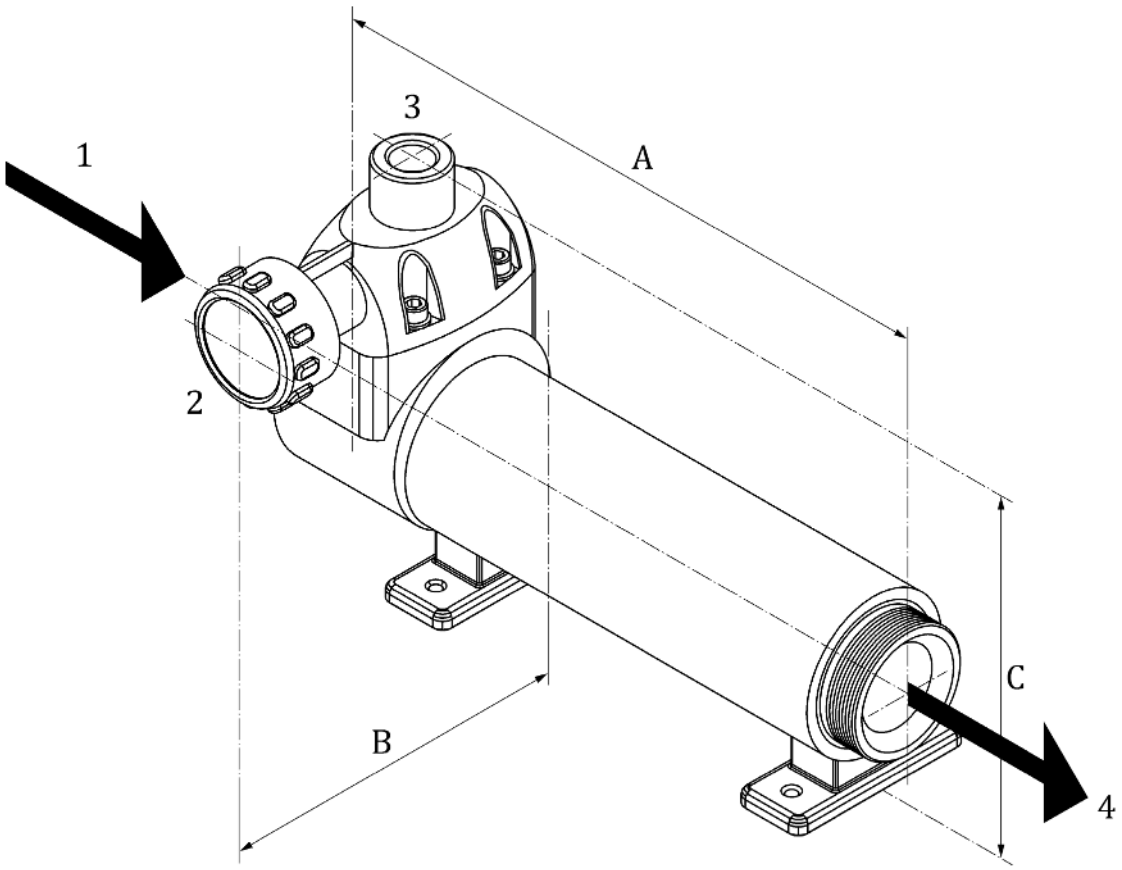
7.2.3 The flow direction shall be indicated by an arrow on the body of the inductor.

7.2.4 The inductor shall be fitted with a pick-up tube according to EN 16712-2.

7.2.5 As hand-held foam branchpipes are not usually equipped with a flushing device, a strainer can be fitted at the water inlet of the inductor if specified by the customer.

NOTE A strainer will cause an additional pressure loss.

7.2.6 Dimensions and masses of the inductor (without coupling) shall be in accordance with Figure 2 and Table 2.



Key

1 water inlet
2 setting device
3 foam concentrate or additive inlet
4 foam water solution outlet

For dimensions A, B, C, see Table 2.

Figure 2 — Example of inductor with setting device

Table 2 — Maximum dimension and mass

Type	Dimension			Mass
	A	B	C	
	mm	mm	mm	kg
Z 0,5 Z 0,5R Z 1 Z 1R	250	150	200	3
Z 2 Z 2R Z 4 Z 4R Z 8	400	200	200	
Z 8R				5
NOTE The maximum mass does not apply to seawater-resistant inductors.				

Verification

Measurement of dimensions and mass.

7.3 Pressures and geodetic suction height

The following pressures shall be used for the determination of the hydraulic characteristics:

— nominal pressure: p_N = 16 bar ± 0,25 bar;

— test pressure: p_t = 25,5 bar ± 0,25 bar;

— burst pressure: p_B = 50 bar ± 0,25 bar.

Verification

The inductor shall be mounted, with caps on the outlet and on the foam concentrate inlet, on a device capable of exerting a hydrostatic pressure of 50 bar (burst pressure p_B). All air shall be bled out of the system.

The pressure shall be increased by 3 bar increments and held for 30 s at each pressure up to p_B.

This maximum pressure shall be held for 1 min without rupturing the inductor.

The geodetic suction height shall be $(1{,}5\ ^{+0,1}_{0})$ m.

Verification

Measure the geodetic suction height with the measure instruction according to Figure 1 or Figure 3.

7.4 Inductors without setting device

Inductors without setting device shall be designed for a single proportioning ratio defined in Table 3 and shall be marked accordingly.

Verification

Visual inspection of the marking.

The foam branchpipe shown in Figure 3 can be replaced by any branchpipe or valve that will give an outlet pressure p_2 of 6,5 bar at the nominal flow rate.

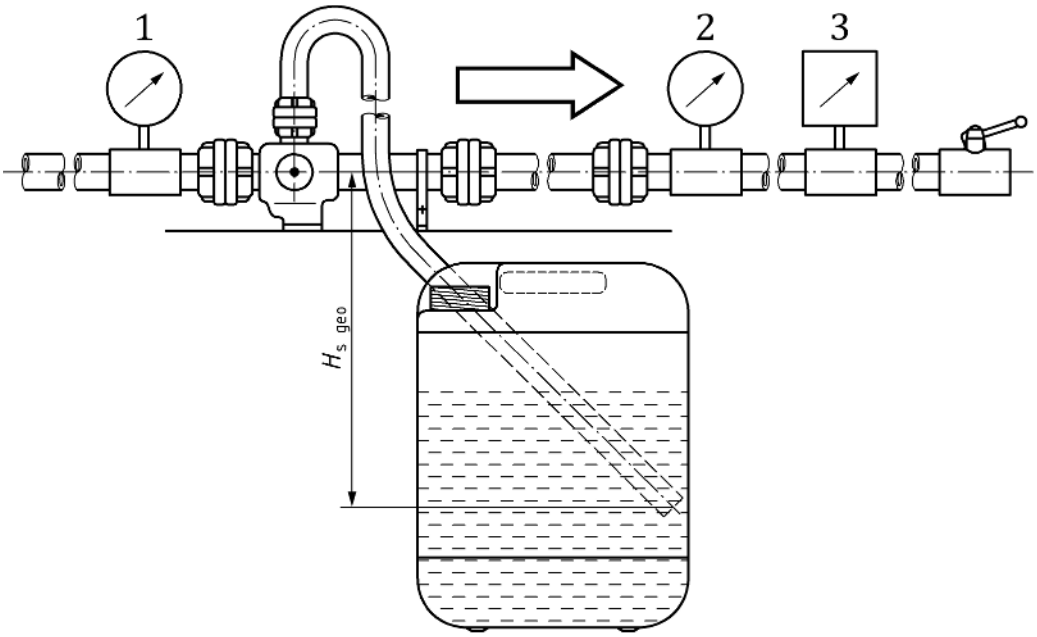
The minimum distance between the inductor outlet and pressure gauge at p_2 shall be 5 times hose diameter.

This test shall be conducted while inducting at the highest proportion ratio marked on the inductor.

Using the control valve or branchpipe, the outlet working pressure p_2 shall be set to 6,5 bar at the nominal flow rate.

Measure the inlet working pressure p_3.

p_3 shall be less than or equal to 10 bar (to reach the inductor pressure loss $\Delta p_2 \leq 35$ %).



Key

1 pressure gauge p_3
2 pressure gauge p_2
3 flow meter
$H_{s\ geo}$ geodetic suction height-inductor in meter

Figure 3 — Installation for the flowrate and proportion ratio tests

7.5 Inductors with setting device

Inductors with setting device shall be designed for a combination of proportion ratios ranging from 0,1 % to 6 % according to Table 3. The setting device shall reduce the proportion ratio if turned clockwise and shall increase the proportion ratio if turned counter-clockwise.

The proportion ratios shall be clearly and permanently marked.

Table 3 — Performance data

Tolerance of the flow rate $^{+0\%}_{-10\%}$

Type	Foam concentrate or additive flow rate [a] at (20 ± 5) °C							
	0,1 % l/min	0,5 % l/min	1 % l/min	2 % l/min	3 % l/min	4 % l/min	5 % l/min	6 % l/min
Z 0,5 Z 0,5R	0,05 [c]	0,25 [c]	0,5 [c]	1 [c]	1,5 [b]	2 [b]	2,5 [b]	3 [b]
Z 1 Z 1R	0,1 [c]	0,5 [c]	1 [c]	2 [c]	3 [b]	4 [b]	5 [b]	6 [b]
Z 2 Z 2R	0,2 [c]	1 [c]	2 [c]	4 [c]	6 [b]	8 [b]	10 [b]	12 [b]
Z 4 Z 4R	0,4 [c]	2 [c]	4 [c]	8 [c]	12 [b]	16 [b]	20 [b]	24 [b]
Z 8 Z 8R	0,8 [c]	4 [c]	8 [c]	16 [c]	24 [b]	32 [b]	40 [b]	48 [b]

[a] At low temperatures (e.g. foam concentrate temperature -10 °C), the foam concentrate flow rate is reduced for physical reasons up to approx 50 % compared to the values at 20 °C. This reduction can be compensated by increasing the proportion ratio, if possible.

[b] With a tolerance of ± 10 %

[c] With a tolerance of ± 25 %

Verification

With all parameters set up as in the verification of 7.4, measure the foam concentrate flow rate at each marked proportion ratio. This flow rate shall be within the tolerance required in Table 3.

Visual inspection of the marking.

7.6 Leak-tightness

The inductor shall be constructed to ensure it does not leak during normal operation.

Verification

The inductor closed with caps at the outlets and on the foam concentrate inlet shall show no leakage during 1 min at the test pressure p_t = 25,5 bar.

NOTE *No leakage means no more than 10 droplets per minute.*

The inductor flowing water without a cap on the foam concentrate inlet shall show no leakage during 1 min at the nominal pressure p_N = 16 bar.

8 Information for use

8.1 Instruction and maintenance handbook

8.1.1 General

Each inductor shall be delivered with an instruction and maintenance handbook.

This handbook should be made available either on paper and/or in a downloadable self-contained digital format (e.g. CD-rom, DVD, USB stick, website, etc.).

8.1.2 Instruction handbook

The handbook shall contain at least the following information:

— name or logo and full manufacturer details including address, phone number and website;

— product safety warnings;

— general information for use.

8.1.3 Maintenance handbook

The handbook shall contain the following:

— maintenance instructions;

— sectional or exploded diagram;

— spare parts list cross-referenced to the diagram.

8.2 Marking

Inductors shall be permanently marked with at least the following information:

— identification of the manufacturer;

— serial or batch number and year of manufacture;

— reference to this European Standard;

— type of inductor as defined in Table 1;

— p_N;

— proportion ratios;

— flow direction.

8.3 Colour coding

The inductor nominal flow shall be identifiable by a coloured band, with a minimum width of 15 mm, as described in Table 4.

Table 4 — Colour coding

Nominal flow l/min	**Colour**
50	No requirement
100	No requirement
200	Yellow
400	Red
800	Blue

It is allowed to add complementary information e.g. flowrate, pressure, corporate logo, etc. on the coloured band. The printed area shall not exceed 50 % of the surface area of the band (see Figure 4).

Figure 4 — Example

Annex A
(informative)

Acceptance test on delivery

Acceptance tests based on the safety and performance requirements of this European Standard may be undertaken upon delivery by the customer, by an independent or national testing organization or by any other third party of the customers' choice and the results of the tests recorded.

The inspection may include

— examination of all of the test results and the conformity documentation,

— confirmation that the inductor specification has been met by visual and functional inspection or test,

— confirmation that the required inductor documentation, as specified in this European Standard, is available,

— confirmation that the performance and specification of the inductor meet the requirements of this European Standard.

Bibliography

[1] EN 1568-1, *Fire extinguishing media — Foam concentrates — Part 1: Specification for medium expansion foam concentrates for surface application to water-immiscible liquids*

[2] EN 1568-2, *Fire extinguishing media — Foam concentrates — Part 2: Specification for high expansion foam concentrates for surface application to water-immiscible liquids*

[3] EN 1568-3, *Fire extinguishing media — Foam concentrates — Part 3: Specification for low expansion foam concentrates for surface application to water-immiscible liquids*

[4] EN 1568-4, *Fire extinguishing media — Foam concentrates — Part 4: Specification for low expansion foam concentrates for surface application to water-miscible liquids*

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